TOOL DIE MACHINE
PROGRESS
THE NATIONAL TOOL AND DIE JOURNAL

TOOLS, DIES, JIGS, FIXTURES, MOULDS, GAGES, MACHINES
Design and Engineering
PRECISION SPECIALTIES
STAMPING and PARTS PRODUCTION
Official Publication
Special Tool, Die & Machine Shop Industry

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1938

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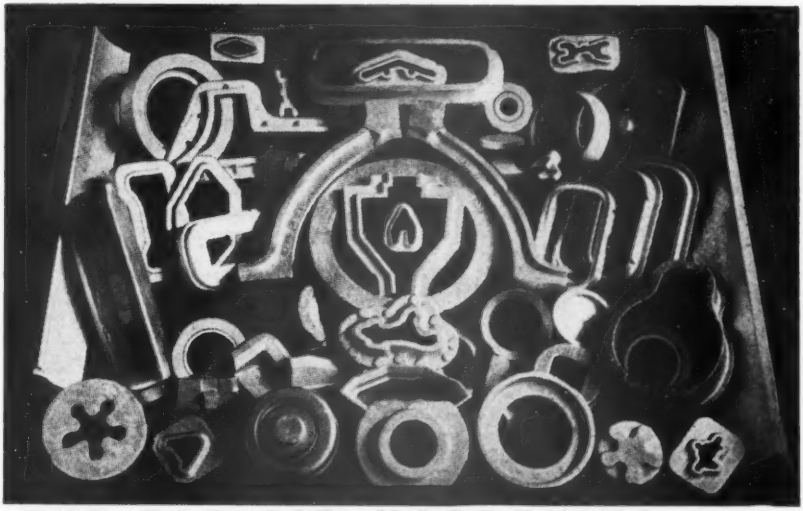

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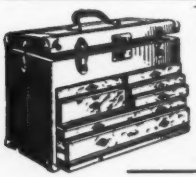

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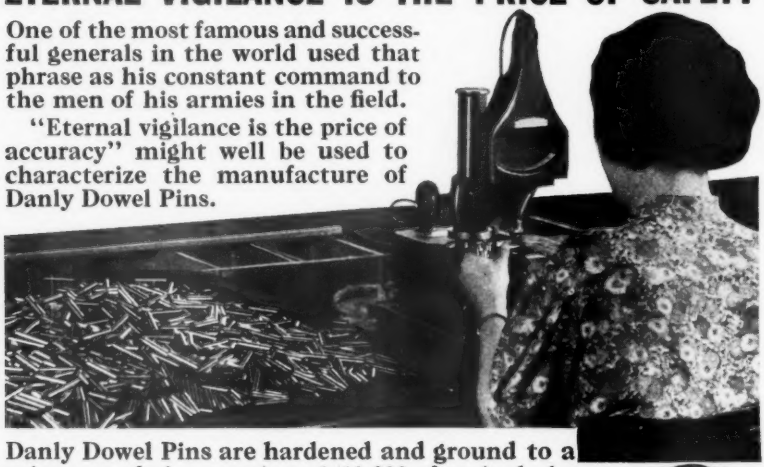

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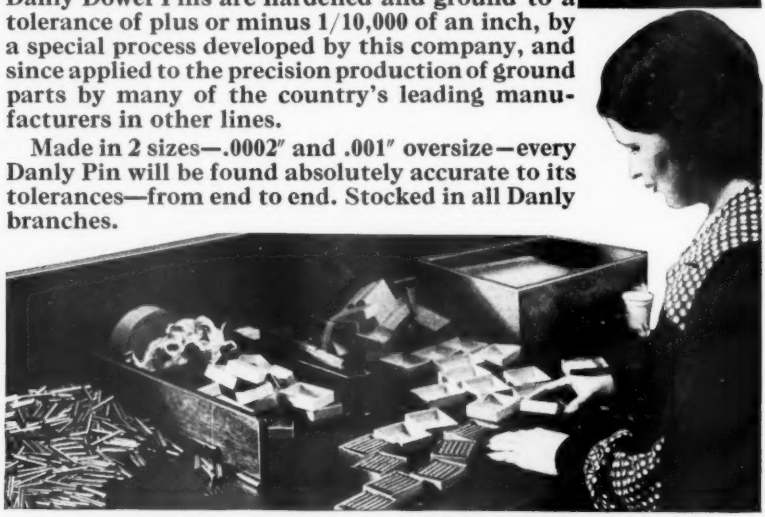

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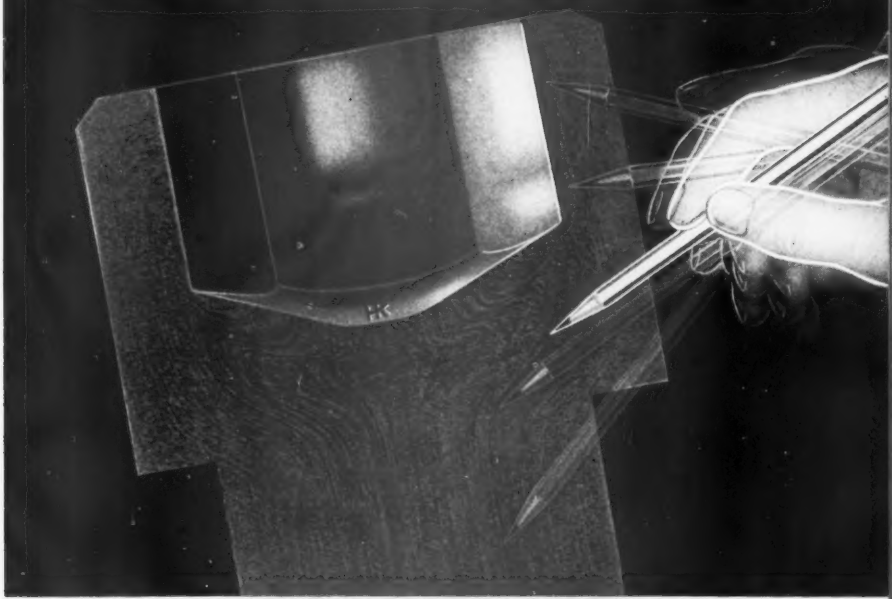

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Tool • Die • Machine **PROGRESS**

The National Tool and Die Journal

December, 1938 **Vol. 4, No. 9**

1939 Business Will Be Better, Predicts Trade Analyst

• • •

COL. LEONARD P. AYRES' annual address before the Cleveland Chamber of Commerce has become of increasing national importance each year. The Cleveland Trust Company's vice president appeared before more than 1,000 industrial and civic leaders this week to express his carefully developed opinion that "It now seems wholly probable that unless some international calamity intervenes, 1939 will be a definitely better business year than 1938 has been. Since last May there has been under way in this country one of the most rapid and vigorous upturns in the volume of industrial production that we have ever experienced. The driving force which has stimulated it has been the great outpouring of federal funds.

"The coming year now promises to be a period of better employment, rising national income, and increased volumes of industrial production. Building construction is advancing, and the volume of privately financed building will almost surely be greater next year than it has been in this one. Trade and transportation may be expected to expand. There seems to be little prospect that commodity prices will greatly change, and so we need not fear next year either a flare-up of inflation or the accumulation of excessive inventories."

In 1939 Col. Ayres believes that there will be the following developments:

"The monthly average of industrial production was 110 in 1937, and it will probably be 85 or 86 in 1938. It now seems likely that its average in 1939 will be about 104 and that it will not be higher or lower than that by more than four per cent.

"National income seems likely to make a new high record for the recovery period, and to be a little above the level of 1937.

"Wholesale prices will probably advance slowly in 1939, with their average level for the year above that of 1938, but lower than that of 1937.

"Average freight loadings may advance about 15 per cent, with the increase probably not less than 10 per cent or more than 20 per cent.

"Automobile output in 1939 should be between 30 and 50 per cent larger than that of 1938.

"Contracts for new construction will probably be larger than those of any previous recovery year. They will probably be the largest since 1930, but not as large as those of that year.

"The value of the department store sales will probably increase so that they will be nearer to the levels of 1937 than to those of 1938.

"The output of iron and steel is likely to be greater than that of 1935 but not as large as the outputs of 1936 and 1937. The advance from this year's level may well be between 30 and 50 per cent.

"Among series likely to make new all-time high records are petroleum refining, output of electric power, tobacco products, and the average hourly earnings of factory workers.

"Merchandise exports will probably be smaller and imports higher in value than in 1938, with imports probably greater than exports.

"It seems probable that the average price of all stocks listed on the New York Stock Exchange will be higher than it has been this year, and that it will be above the level of 1935 and below that of 1936."

The discouraging but perhaps not entirely hopeless factor in national business recovery, according to Col. Ayres, is this pump-priming. It will continue in 1939 and thus stimulation will be effective but such government spending cannot and should not go on indefinitely. Whether or not we shall continue into a period of permanent recovery is dependent upon several important conditions. If our people have "become convinced that government is primarily responsible for business activity," then it is time for them to realize the futility of believing "that we can spend ourselves rich" any more than "a man can drink himself sober."

"This financing of a normal recovery requires two groups of participants, one composed of eager borrowers, and the other of willing lenders. Both of them are made up of people who are both willing and eager to take present risks in the hope of making future gains. If they are not both willing and eager, one set will be slow to borrow and the other set will be reluctant to lend, and when those conditions prevail normal recoveries do not develop. Under those circumstances governments may resort to pump-priming in the attempt to stimulate a business recovery into being. Such a stimulated recovery differs greatly from a normal recovery, and does not readily develop into one.

"The fatal weakness of such a recovery (pump-priming) is that everyone fears that it may be only temporary. Manufacturers repair their plants, but they hesitate to build new ones. Retail merchants enlarge their stocks but not their stores. Automobile manufacturers re-design their radiator grills and change the patterns of their stainless steel trimmings but hold back on costly new models. Everybody tries to play safe and avoid risks."

"The essence of business confidence is faith in the future. Business confidence is confidence in the prospects for profits. Unfortunately there are two great sectors of our business economy that now lack confidence in the future, and which are not likely to regain it in 1939. They are our railroads and our public utilities, and together they constitute a very large part of American business."

"Our railroads are suffering from an acute form of deficiency disease, and it is caused by a lack of the financial vitamin that we know by the name of profits. Until a reasonable supply of that financial vitamin is restored to them, the railroads will not again be good customers of the other industries."

"If one were searching for a single indicator to show whether or not we were making a real recovery back to normal conditions, he might perhaps find the most reliable one in the figures showing what proportion of our entire output of finished steel consists of heavy products. In normal times half of all the steel produced in this country goes into heavy products such as plates, beams, rails, and castings. They are used for construction, railroads, power plants, machinery, and production equipment.

"In the past seven years only about one-third of the steel output has consisted of heavy products. The other two-thirds has been made up of the light products that go into such things as automobiles, refrigerators, household equipment, and containers for canned goods. In large measure the heavy products are bought by producers and paid for by security issues, while the light products are bought by consumers and paid for out of wages.

"Those steel figures hold the key to our recovery problem. If we could once more turn a normal proportion of our national energies back to production financed by expanding enterprise our recovery problem would be solved. It will be done when business men have enough

(Continued on page 38)

Only a Mutual Understanding of the Finished Stamping Requirement Assures Satisfaction To Both Die Buyer and Seller

As told to the Editor by a Department Executive whose years of experience include all of the details of die designing and engineering, tryout and stamping production. As an expert die engineer, he may at one time be buying dies from a T·D·M Contract Shop and at another time selling dies designed under his direction to a large buyer of metal stampings. His advice to both die buyers and sellers is noteworthy.

• • •

THE buyers and the sellers of dies are two groups of Industry officials who have much to gain by more careful consideration of the details which enter into their respective responsibilities.

The man who buys may be a purchasing agent, engineer, superintendent or even the die room foreman of a stamping plant. Perhaps all of them come into the negotiations at one point or another. The seller, or perhaps we had better say the builder of a die, usually is a die shop executive or the owner himself, cooperating with his salesman and also frequently drawing into the picture his engineer or shop superintendent.

The designing and building of dies probably lends itself even less to standardized practice than does any other type of product tooling. A new die usually is designed and built when there is to be a part or product change, therefore by the very nature of what it is intended to accomplish every die is different from every other one.

One of the most difficult problems that confronts the buyer and the seller of dies is the one of inspection. The characteristics of the stamping, or to say it differently, the degree of quality of the stamping, are the direct result of the characteristics or the quality of the die. Accuracy of product dimensions, exactness of punchings, perfection of contour—all depend upon the design of the die, the accuracy of its construction and the materials and parts which are used.

If the buyer intends to make use of the die in his own plant, he is very likely to be somewhat less exacting in his product inspection than if he is buying stampings from a contract manufacturer. He has only his own inspection department to satisfy and by working in conjunction with his sales and engineering departments it is not difficult to decide upon the degree of quality required and thus to govern his product cost, whereas, because it is so often easier to satisfy one's own standards than it is for someone else to do it, a contract manufacturer may be held more closely to the line by the inspection department.

Even with years of experience in the

manufacture of metal stampings, it is difficult for one to know just what the other fellow considers satisfactory, therefore it is important that this matter of agreeing upon just what constitutes a satisfactory stamping be worked out early in the negotiations for if it is necessary to make die changes or add operations so that a product will be passed as satisfactory, cost may increase considerably. A buyer of dies can make his inspection only after a die has been completed, tried out and some of the stampings run off. If these first stampings do not meet the buyer's requirements, it is not always because the dies have not been made according to specifications and it is to avoid the possibility of additional expense for either the buyer or the seller that we suggest the following as a procedure which will come very close to insuring satisfaction to both sides.

The first essential certainly is that representatives of both buyer and seller have a thorough knowledge of die making and metal stamping methods. What is so often the first consideration in the mind of a buyer is "What's the price?" This should really be almost the last consideration as it relates to buying dies because if the quality of a stamping is so directly dependent upon the characteristics of a die, then the requirements imposed by product quality become the first consideration. It is only when these requirements are plainly set forth, that a die builder can quote intelligently and guarantee die performance and product quality.

A die builder should be given the following information in one of the three methods indicated:

1. By die design, carefully planned and accompanied by specifications which have taken the following items into consideration:

   a. Anticipated number of part pieces to be produced from the die,
   b. Size and stroke of press,
   c. Suitable materials to insure minimum maintenance during life of die,
   d. Previous experiences at time of tryout or when running production on similar jobs,
   e. Strippers and knockouts of proper strength to remove the work from the die,
   f. Necessary gages and work rests properly located,
   g. Guide posts, screws and dowels, heel blocks, air holes, eye bolt holes, etc., to suit the buyer's standards,

2. If without die design, by furnishing the die builder with the following:

   a. Part prints,
   b. Operation line-up sheets,
   c. Press data,
   d. Sketches or designs used on similar jobs,

3. If only part prints are available the buyer must expect to rely upon the die builder's ability, experience and judgment for design and method of construction.

The first method is by far the best because both the buyer and the seller have a thorough understanding of what is required. Also if there is competition, it is on a comparable basis. The second method is a satisfactory one when the buyer does not maintain an adequate die design department and the seller or die builder has on his staff experienced die designers with a thorough working knowledge of both die building and stamping manufacturing. Competitive bidding should be fairly close by this method also because reasonably good information and data have been furnished. The third method can hardly be as satisfactory as the second because without information other than part prints, each die builder who is quoting will design according to his own ideas. Prices then may not be on a comparable basis and there is the possibility that the buyer's equipment and general manufacturing peculiarities may not be taken into consideration as they should.

A self evident advantage of the first method is that under it the buyer and the seller have a mutual understanding from the very beginning, whereas with the other two, and particularly the third, the die builder bases his price on what he thinks the buyer requires. Designs cannot be made and submitted for approval until after the job has been

(Continued on page 38)

New Series of Die Designing and Estimating Articles Begin in January

THE first group of our series of articles on "Die Designing and Estimating" ends with this issue. Such favorable comments and so many requests for back numbers of the issues which carried this series by Charles Bohmer have been received that we have decided to publish them in book form.

Beginning in January, George Dannes of the Raffel Manufacturing Company, Chicago, Illinois, starts his series on advanced Die Designing and Estimating as he is teaching the subject to the evening class in the Carl Schurz High School.

Mr. Dannes' first article in January will lay the groundwork for the entire course. It will emphasize the necessity for a simple but accurate method of determining tool and die costs and will serve as the introduction of the method to be explained in detail in subsequent articles to be published during the year. Machine and hand operations have been carefully charted and tables established from actual time studies. The use of these for arriving at labor costs of simple blanking, progressive, piercing and blanking dies, multi-step dies, forming and drawing dies proceeds in the same manner as in the class which Mr. Dannes teaches.

Mr. Bohmer's articles having proven so interesting to our readers, we look forward with satisfaction to including those by Mr. Dannes each month.

—THE EDITOR

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AN EDITORIAL

Henry Ford Expresses Our Christmas Wish

THE customary Christmas greeting is one of Joy and Peace. It is true that these are not necessarily determined by one's financial status, because there are happy people who are not wealthy. But the old saying still holds good that Christmas is a time when a little extra money goes a long way. It is the season for the giving of gifts and to give gifts one must be able to buy them. There you have the economic side of Christmas.

For many industries and businesses, the Christmas trade is the year's most important. The sales of almost all products that move through retail channels are built up to a peak by the Christmas business. Many a new refrigerator, stove and radio comes into the home at that season of the year and toys are bought in such volume that these sales constitute more than fifty per cent of the entire year's total.

It is evident then that Christmas occupies a place of great importance for men and women in business.

Regardless of 1938's totals of Christmas sales, they will not be enough and we must go into 1939 without a serious post-holiday let down. Millions of Americans are not givers of Christmas gifts this year or to put it in another way, they are not *buyers*. Among them are employers and employees. Thousands of businesses have not been prosperous, their owners and executives living on greatly reduced incomes just like workers whose wages they have had to cut. They are the businesses, the men and women workers who must have more income in 1939 if they are to become buyers. And if they do not then Christmas of 1939 will find the state of the nation's business no better than it is this year.

For some, the facing of this fact may be discouraging. But read what Messers. Henry and Edsel Ford recently authorized as their opinion of what the future holds for us.

"We are not defeatists. We do not believe this country has seen its best days. We believe this country is yet in the infancy of its growth. We believe that every atom of faith invested in our Country and our People will be amply justified by the future. We believe America is just beginning. Never yet have our People seen real Prosperity. Never yet have we seen adequate Production. *But we shall see it!* That is the *assurance* in which we have built."

"Every atom of faith invested in our Country and our People" must continue to be a dominant note because, the Fords say: "Business if not just *coming* back. It will have to be *brought* back. *That* is now becoming well understood in this country; for that reason 1939 will be a *co-operative year*. Manufacturers, sellers and buyers will co-operate to *bring back* the business that is *waiting to be brought back*."

That brings us to *our* Christmas greeting and New Year's wish:

May the Goodwill of this Christmas Season permeate the thought of every man whose livelihood should come from industrial wages or profits. May the New Year of 1939 be such a co-operative year as the Fords predict. May it be cooperative in the fullest sense—as between employer and employee; labor union and industrialist; Government and Business.

GEORGE J. HUEBNER, *Editor*.

Die Designing and Estimating

By CHARLES BOHMER

This eleventh article concludes the first part of the series on "Tool Designing and Estimating" as this subject is being taught to Tool and Die Shop apprentices under the auspices of the Chicago District of the Special Tool·Die·Machine Shop Institute in the Carl Schurz High School. The author, Charles Bohmer, tool superintendent of the Federal Tool Corporation, is one of the class instructors.

Curling Dies

CURLING dies are used to curl the rough or sharp edges of a part and thus strengthen it as well as improve its appearance and lessen the danger of injury in the use of the fabricated article. Typical applications of the curling operation are the edge of a frying pan cover, the edge of a sauce pan and similar kitchen utensils.

The component parts of a curling die unit are:

The Die
The Center Block
The Curling Ring
The Punch

THE DIE

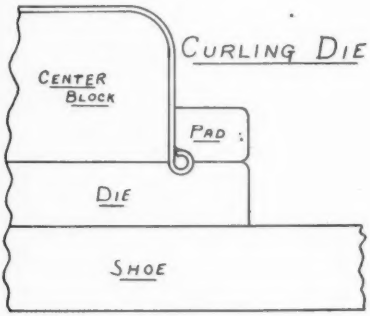
The die is made of tool steel turned to the proper size and shape, hardened, polished and ground. The radius of the die edge determines the size of the curl and it is very important to have it very smooth to eliminate possibilities of the part collapsing or wrinkles forming at the curl. The die is usually mounted on the shoe and securely fastened by screws and dowels.

THE CENTER BLOCK

The center block supports the part and prevents collapse or distortion. Depending upon whether the blank is straight or tapered it is mounted with or without spring action. It is hardened and must fit the inside of the blank as closely as possible because of gauging requirements. The block is mounted on the shoe if the die is of the ring type or on the die if it is the solid type of construction. It must be held securely in the customary manner.

THE CURLING RING

The curling ring is not always needed but if the material has a tendency to straighten out rather than follow the lead of the die it is important for controlling the curl. The ring must have the same working radius as the die so that when they come together a complete circular cavity is formed. When the blank is forced down there is then no possibility of escape for the metal, the result being the formation of the desired curl. The ring should be of the same material as the die and as highly polished. One very important point is the accurate matching of the ring and the die to prevent interference of the part as it is curling. The ring is mounted on the punch holder on springs and in such location that it contacts the die before the punch forces the blank down.



THE PUNCH

The punch varies somewhat in construction depending on the material to be curled. If there is possibility of collapse, the punch must fit the outside of the part accurately; if not then the punch may be a flat block that matches the upper part of the blank. The purpose of the punch is to push the part down into the die and it may or may not be mounted on springs on the punch holder depending upon whether a stripping action is needed. If the punch is mounted on springs the pushing action does not occur until it has bottomed, an important point in controlling the amount of curl.

From this description and the required functioning of the various parts of the die, the construction may be summarized as follows:

The die mounted on the shoe, a center block also mounted on the shoe, a curling ring mounted on the punch holder and a punch.

To operate: The part is placed over the center block and as the punch descends, the curling ring contacts the die, making a complete cavity into which the material is forced by the punch and thus the curling takes place. As the punch moves up, the part is left on the die. When removed it leaves the die ready to receive the next blank.

There may be several variations in construction such as mounting the die on springs to strip the part from the center block or the insertion of spring pins to strip, but in principle all the dies are the same. In some cases it may even be desirable to mount the die on the punch holder and perform the operation in that manner but regardless of variations one thing is of great importance and must always be considered, that is, never construct the die in such a way that the part will lock itself, thus making stripping impossible without completely destroying the part.

Curls are of two types, outside and inside, the former being comparatively simple to make, the other extremely difficult. This is due to the fact that an inside curl reduces the area of the material thus causing wrinkles and overlapping of the material, while the outside curl stretches the stock and eliminates the possibility of wrinkling. Both types can be made in dies but if unusual difficulties are encountered with operation may be successfully performed with spinning or rolling tools.

Shaving Dies

If a blank must have exactly the same dimensions on both the top and bottom surfaces or if the edges must be square and smooth, it is sometimes necessary to add a shaving operation, particularly if metal thickness and temper are such as to cause a break in the edges of the blank or of the hole if piercing. For the best results this operation should follow after the part has been blanked or pierced and with the die constructed to receive the blank exactly in reverse to the procedure followed in the previous operation, in other words, the blank should be placed in the shaving die with the punch side to the die and the die side to the punch. This factor is important because the greater part of the material to be shaved is on the die side of the blank or where it is cut and if the part is placed die-side to die the material will have to pass the entire thickness of the blank, resulting in a second break which is sometimes objectionable. The amount of stock to be left on the blank for shaving is another important factor and varies according to the break. It is usually directly proportional to the amount of clearance between the blanking punch and the die necessary to obtain a clean blank. This means that the blanking punch should be the size of the finished part, the clearance between it and the

blanking die being the correct amount needed for shaving.

The construction of the shaving die is very much the same as that of any piercing or blanking die with the exception that no clearance is needed between punch and die other than enough to permit them to fit together. Also the punch and die must have a very smooth finish to prevent scoring. As was stated previously, shaving should usually be a separate operation; however, this is not always necessary or even possible if the blank is very small and difficult to handle, in which case the operation may be included in a progressive arrangement and although the results may not be quite as satisfactory it will mean considerable saving in production costs.

Blanks of comparatively thin material requiring smooth sides can be made by having the blanking punch and die closely fitted; however, this should not be attempted with heavy material because of the dangers of early die breakage and heavy burrs.

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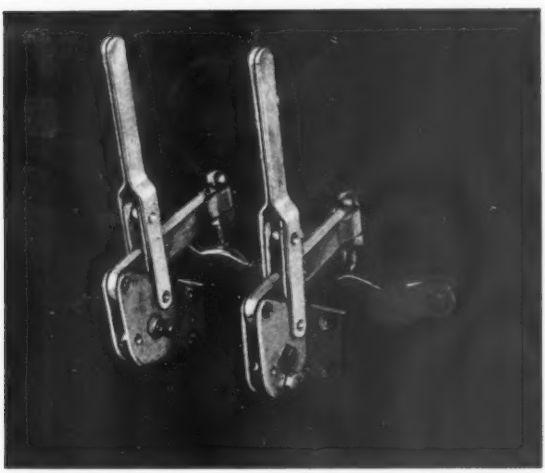

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Pioneer Tool Shop Owner Retires From Business

JOSEPH H. LYONS has sold his tool shop. His retirement from this field of highly technical service in which he has been so successful, marks the completion of a business career filled with events which stand out as historical milestones of the Industry itself. As a boy, Joseph Lyons started in the plant of the new Martinsville Glass Manufacturing Company. It was not long before he came to Cleveland to learn the machinist trade in the shop of the Cleveland Twist Drill Company where he remained for eight years. He was then employed by the Ferro Machine and Foundry Company until, on a memorable day in October, 1912, he opened the doors of a small machine shop at 321 Frankfort Street. In those days there were no contract or job tool shops and the business of the Lyons Machine Company consisted almost entirely of machine repairs and replacements.

"But there were lots of inventors springing up everywhere and we began to get into development work. Some of those fellows had a little money but you had to watch your step because usually they were long on ideas and short on cash. However, it was the beginning of the age of production machine development and it received a big push forward with the demands made upon our country by those engaged in the World War. The war did much to develop the present tool shop and today you have some of the finest precision tool and machine

(Continued on page 38)

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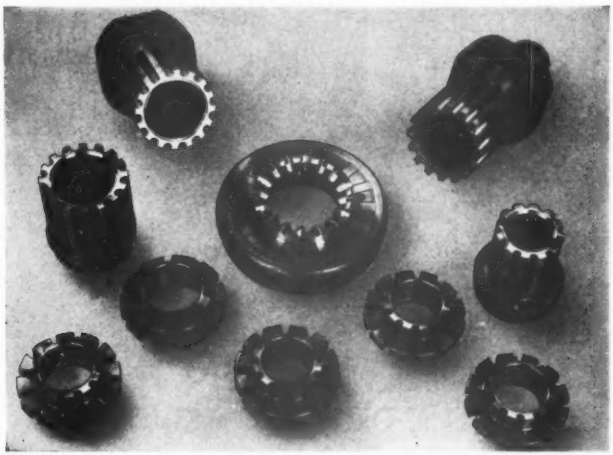

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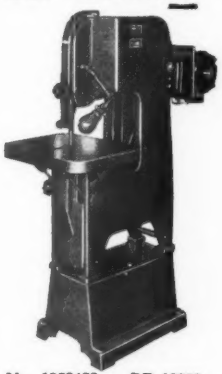

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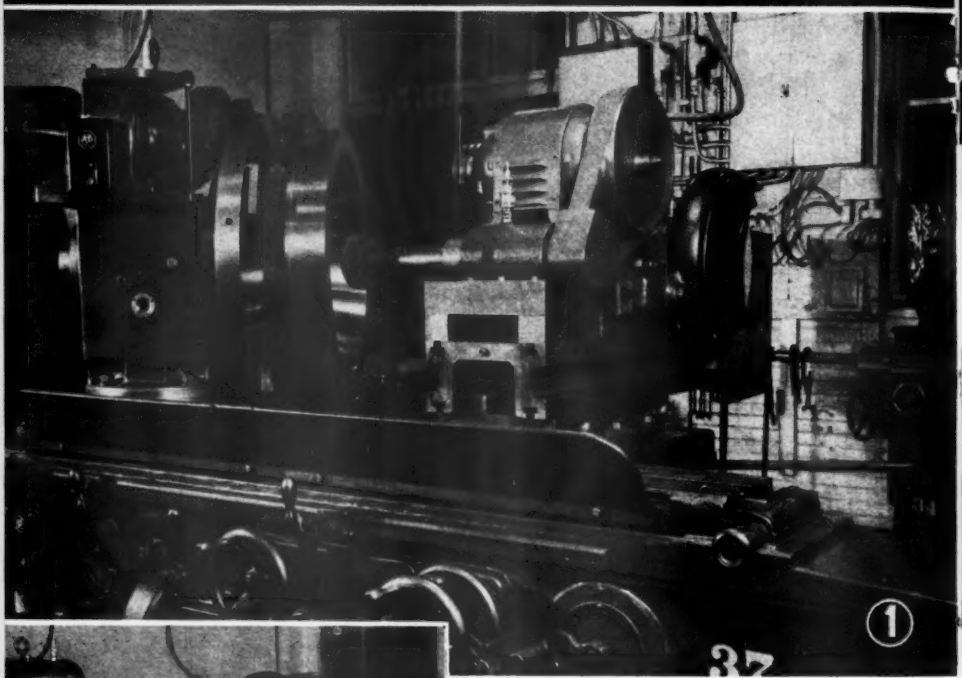
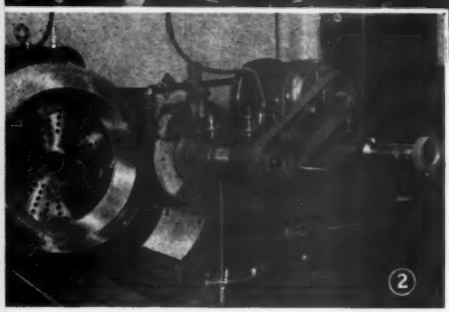
The Modern Tool-Die-Machine Shop Must be Versatile . . .





nd this is particularly true of its facilities for inding. Equipment must be easily and quick- adaptable to the varying requirements of any different jobs. Standard types of ma- ine tools are essential, of course, but even ore important in our shop are special ma- ines, tools and accessories which we have veloped and built and special machine set- s which we use.

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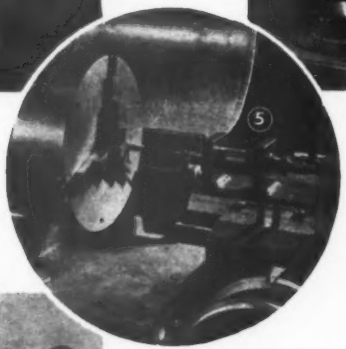

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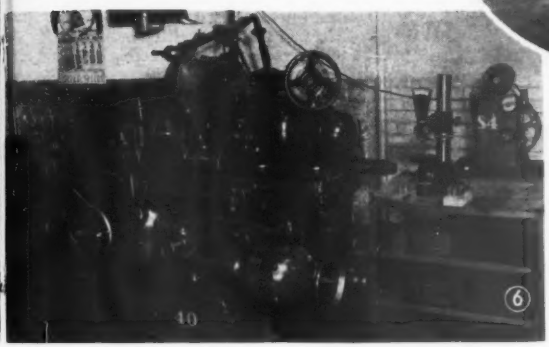

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3. View from bac of grinder whic shows abrup taper more dis tinctly. Ordinar equipment does not usually have the rang required for such angular grinding.

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5. Contrast this set-up with the mold ring o the 3-motor grinder. This air turbine spindl with a speed of 100,000 R.P.M. has bee mounted on a standard type machine to grin a ⅛″ hole in a precision gauge.

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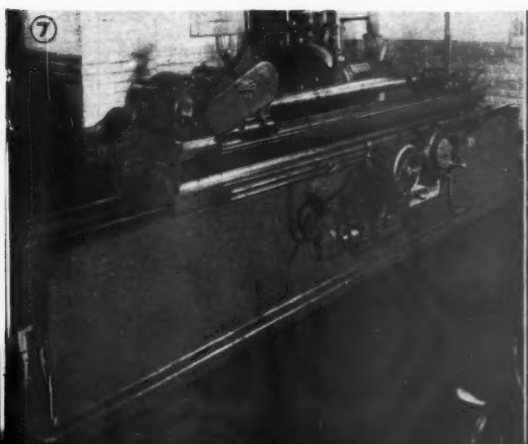

Chart of Drill and Reamer Sizes

The general practice for sizing of holes for dowel pins may be said to approximate the following:

In cast iron or steel drill $\frac{1}{64}$" under dowel pin size.

In cast iron ream .0005" undersize.

For a press fit of a ¼" dowel pin, reamer should be .2495".

If the dowel is to be fitted in tool steel which is to be hardened use reamer of standard size. Shrinkage in hardening should take care of the press fit.

Remove scale by polishing or lapping.

When using a very high grade of tool steel some shops use this pratice:

Drill $\frac{1}{64}$" undersize.

Ream .002" undersize.

Ream with reamer .0005" plus .0000" minus .0002" undersize. The reamer has .0005" back taper in 1½" and is end cutting with no relief ground on periphery.

Harden tool steel and lap hole to fit reamer.

Ream casting, using the hardened tool steel die as a jig and same reamer practice as above—.002" undersize and .0005" plus .0000" minus 0002".

This data has been furnished by Danly Machine Specialties, Inc., 2121 South 52nd Street, Chicago, Illinois, and a card prepared for permanent use and including additional dimensional data on Danly precision dowel pins is available upon request for chart TD.

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New Catalog Contains Important Data

CONCENTRATION on the development of quick detachable end cutting tools for 24 years establishes the Eclipse Counterbore Company as a specialist in the field of precision manufacturing methods.

A new catalog issued by the company contains carefully compiled descriptive data on the four different drive methods which have been developed to effectively meet the requirements of various types of interchangeable end cutting tools. They are the double radial drive for heavy duty counterbores, the pin drive for counterbores and countersinks used for general work, the double parallel drive for inverted spot facers and the square taper drive for two-piece core drills.

Radial drive type counterbores were developed to meet manufacturing conditions requiring sturdier tools. They utilize the practical principle of driving direct on center line, there being two pairs of radially arranged driving surfaces located between two accurately ground aligned surfaces. Construction permits the driving mechanism to be closer to the cutting edges than ordinarily, thus minimizing torque.

Of particular interest to tool and die makers are sections describing die sinking cutters, end mills and boring tools. For shops which do not use counterbores and countersinks as extensively as they are employed in high production, there are specially selected sets of radial and pin drive interchangeable counterbores. Likewise for tool room use there is a special set of solid integral pilot counterbores for use for fillister head screws.

The catalog includes also new loose leaf pages describing the new Eclipse boring tools with Mikro-lok adjustment. This new bar is manufactured in three styles—for jig boring with a micrometer adjustment of .00025", for rough or finish boring with two blades adjustable in increments of .0005" and the third with fixed or floating blades particularly adapted to the general work in contract tool, die and smaller production shops.

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Sells Interest in Ulmer Company, Buys Lyons Machine

ROBERT KIFFER, for 15 years superintendent of The J. C. Ulmer Company of Cleveland, Ohio, has sold his stock interest in that company and purchased from Joseph H. Lyons the equipment and good will of the Lyons Machine Company located at 5601 Tillman Avenue, Cleveland. The new company will be known as the Kiffer Tool and Die Company.

Mr. Kiffer's long experience in the contract shop field includes design and construction of all types of dies, machines and special tooling of every description, while the Lyons organization has specialized in the building of precision machines of the most intricate types for leading Ohio manufacturers.

The equipment in the Lyons shop includes, in addition to the customary machine tools and accessories, a No. 5 Swiss Jig Boring Machine and special grinding and electric heat treating equipment for fabricating tungsten carbide tools.

John L. Lyons, more recently associated with his father in the operation of the Lyons Machine Company, will continue as engineer of the new Kiffer organization.

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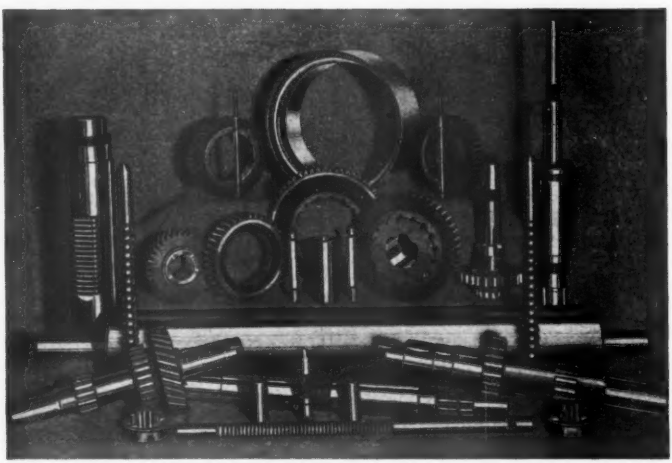

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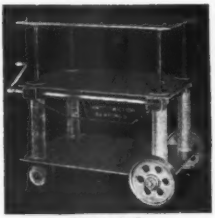

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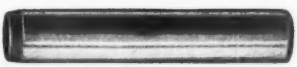

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Principles Underlying the Heat Treatment Of Carbon Tool Steels

By William Jessop
William Jessop & Sons, Inc.

WHAT goes on in a piece of tool steel during the process of hardening? The metallurgist and the steel treater know the process technically. Here a tool steel manufacturer sets forth the mechanism of hardening in language readily understood by every user of tool steel.

HARDENING, being one of the most important operations in tool production, should be carried out with the precision of a machining operation in order to get the best results.

A properly annealed straight carbon steel containing around about one per cent carbon consists of a mixture of about 15 per cent carbide of iron, known as cementite, the balance being iron, known as ferrite. The cementite may be distributed throughout the mass in the form of plates when the material is said to be pearlitic, or in the form of globules when the material is spoken of as spheroidized. Either, or a combination of these states, may be produced by varying the conditions of annealing. On heating the steel, as soon as a certain temperature known as the decalescence or critical point is reached, the whole of the carbide of iron tends to dissolve in or form a perfectly homogeneous mixture with the iron.

This temperature is in the neighborhood of 1360° F., and if the steel be maintained at 1400°-1450° F. (according to carbon content) for a sufficient period of time, the whole of the cementite passes into solution and in order to get perfect hardening it is necessary that this solution should be completed.

But this temperature grain growth is fairly rapid, and if the heating be too prolonged, a coarse fracture is obtained after quenching. This determines the first precaution which should be taken, viz., the soaking time should be long enough to complete the change, but not long enough to bring about undue grain growth.

In this hot state the steel is said to be austenitic, and it is now in a condition to enter the hardened state. By the very rapid cooling induced by quenching, the steel remains hard, but slow cooling allows the steel to regain its soft or annealed condition to a degree which is determined by the rate of cooling. In order better to understand the mechanism of hardening, it is desirable first to investigate the changes which go on in the steel during slow cooling.

In the initial stages, the steel cools down at the same rate as the furnace until the temperature reaches the critical temperature on cooling known as decalescence. This temperature is 1290° F. for straight carbon steels, and 1250° F. for the high manganese type of oil-hardening steel. At this temperature the carbide of iron is rejected from solution, and the heat of solution is evolved, causing a halt in the cooling. After the whole of the carbide has been rejected from solution, the steel then continues to cool down at the same rate as the furnace.

It will first be noticed that the decalescence point (Ac) is higher than the

recalescence point (Ar), and this explains why a piece of steel will harden at a lower temperature on a "falling heat" than on a "rising heat," a fact which is well known to all practical hardeners. This temperature gap between the critical points on heating and cooling is of all-importance in the efficient heat treatment of steels. The rate of cooling through the Ac to Ar temperature range is by far the greatest factor in determining the final state of the hardened and tempered tool.

As may be expected, the reformation of the carbide from solution takes place in several stages, the first stage being the formation of minute particles which gradually grow from ultra-microscopic size into globules which can be readily distinguished under the microscope. In this state the steel is said to be sorbitic. If the cooling is carried on at a still slower rate, the particles associate themselves into plates or rods, and give rise to pearlite, which is the common form of fully annealed carbon steel. By reheating this fully annealed steel to a temperature between the Ar and Ac points, say 1330° F., these plates or rods of cementite coalesce into globules again, and the steel is said to be "spheroidized," which condition is maintained if the cooling be fairly rapid.

Having got the picture of the effects of slow cooling in our minds, we can now pass on to a consideration of the effects of very rapid cooling or quenching.

Quenching acts by preventing or tending to prevent the precipitation of the carbon from solution in the form of cementite. But in straight carbon steels the precipitation is so rapid that it is impossible to prevent it altogether, except by the drastic method of quenching in liquid air. After such treatment the steel is quite homogeneous, and is said to be austenitic. Strangely enough, this condition is not that of maximum hardness. Quenching in cold water or brine brings about a kind of intermediate state between the austenitic and the sorbitic, in which a certain proportion of the carbon has been rejected from solution in the form of extremely minute particles uniformly distributed throughout this mass, and it is this factor which is the principal cause of the hardness of steel. Added to this, there is the molecular stress set up by the effort of the dissolved carbide to revert to its stable or undissolved condition, which contributes its quota to the hardness.

During the quenching operation the outer layers of the steel, being in contact with the quenching medium, lose their heat rapidly, but the heat of the interior has to be dissipated through the outer layers. As a result of this, the outer layers tend to contract on the interior, and this sets up internal stresses purely of a mechanical nature. These internal stresses may become great enough to cause rupture of the steel, a tendency which increases with the mass of material. The study of these internal stresses is of great importance to the practical hardener in carrying out hardening with a minimum amount of cracking. Irregular heating or cooling, of course, affects the distribution of the stresses, and irregularly distributed stresses are much more liable to cause cracking than stresses which are distributed uniformly. This accounts for the greater tendency of intricate sections and those containing sharp corners to crack.

Fortunately on reheating the hardened steel, internal stresses are released at lower temperatures, and at greater rates when hardness is lost. In fact, it can be stated categorically that a properly hardened steel does not lose any of its hardness at temperatures below 350° F., while even boiling in water allows the release of considerable amount of the internal stress.

With regard to quenching media, it is a well known fact that their hardening power is rapidly lost as the temperature increases. This is particularly the case with water, the hardening power of which rapidly decreases with rising temperature.

In spite of all this, water is the best quenching medium for carbon tool steels, but the tool should be moved about in the water, of which there should be a supply sufficient to keep the temperature below 85° F. On the other hand, very cold water is liable to cause cracking by increasing the internal stresses. Consequently the temperature of the water should not be allowed to fall below 65° F.

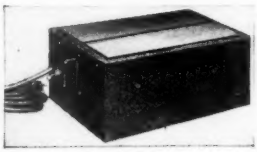
Brine does not lose its quenching power with rise of temperature at anything like the same rate that water does,

(Continued on page 31)

New Tool Room and Die Shop Demagnetizer

The new Arlavox demagnetizer, built particularly for use in tool rooms and die shops, will handle dies up to five inches in thickness. Every part used in its construction is oversized in order to assure efficient, continuous heavy duty operation. The transformer has been thoroughly impregnated with a special compound and draws 10 amperes of current, operating on 110-volt alternating current. Because of this extra power the demagnetizer is suitable for demagnetizing deep drawing dies as well as blanking dies.

The first Arlavox demagnetizer was built by the Arlavox Manufacturing Company for use in its own tool room. Its effectiveness as a time and money saver was so apparent that its manufacture was undertaken on a commercial scale. It embodies the years of experience in transformer manufacturing, and the fine craftsmanship characteristic of the other electrical and mechanical products built by the Arlavox Manufacturing Company, including an Exciter unit for magnetic chucks and Arlavox magnetic chucks themselves.



The demagnetizer measures 8¾" x 11" x 5½" and weighs 55 pounds. It is simple to operate since all that is necessary is to place the work to be demagnetized on the pole pieces and turn on the switch. After a few seconds remove the work from the demagnetizer, raising it slowly until it is a few feet away, then turn off switch.

Descriptive literature is available and may be had upon request for bulletin TD-41, Arlavox Manufacturing Company, 428 South Green Street, Chicago, Illinois.

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LATEST TYPE EQUIPMENT
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- *Sand Blasting*

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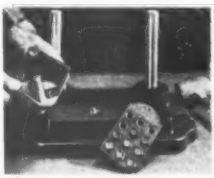
Write or phone for our copyrighted Hardness Conversion Chart

"Doall" Issues New Case Record and Handbook

AN enlarged and revised edition of Continental's Contour Machining Handbook and recent case record book entitled "25 Ways to Cut Machining Costs." Complete engineering data on DOALL contour sawing and filing technique is included. Case records include actual job illustrations of material used, method used, former time, time saved and material saved. The DOALL is shown sawing and filing dies and punches, jigs and fixtures, special parts, templates, cams, and die shoes. An interesting history of sawing and filing dating back to the Neolithic or stone age and major developments to the present day is included. DOALL improvements described are the new precision contour band saws, the job selector dial and the infinite speed indicator for determining the correct sawing and filing speeds for every material; fully automatic butt welding and saw brazing; the new segmented flexible swedish steel file band. In addition machine attachments are described including disc cutting unit, metal etcher, magnifying glass, power work feed, screw work feed, and band polishing attachment. This 150-page handbook is of interest to a large variety of general manufacturers and of specific interest to builders of dies, cams, templates, jigs, fixtures and special parts. Write Continental Machine Specialties, Incorporated, 1303 South Washington Street, Minneapolis, Minnesota, for TD-55.

NIELSON TRANSFER SCREWS
Locate drill holes perfectly and quickly



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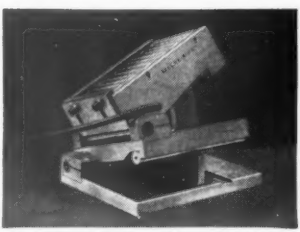

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For tool room — die shop — production plant.

A model for every requirement.

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Write for descriptive circular and price list

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The Catalog Review

Brief descriptions of current industrial literature including technical booklets and bulletins, catalogs and circulars. All may be had upon request, without charge. . . . Please use identification numbers.

TURRET PUNCH PRESSES.—A circular describing these presses which have been developed particularly for jobs which require frequent die changes—short runs, odd lots, small production. Nine types are illustrated, varying in the number of stations from 8 to 32 and in pressure capacity from 12,000 pounds to 160,000 pounds. Quick, precision alignment of punches and dies is possible regardless of whether they are shaped, irregular or round, or in combination. These turret punch presses are in use in dozens of industries, among them: Air conditioning, aircraft, boilers and tanks, conveyor systems, electrical, farm implements, furnaces, metal buildings, metal stampings, radio, sheet metal, shipyards and stoves, and those fabricating products of non-ferrous metals, rubber and fiber. Write Wiedemann Machine Company, 1829 Sedgley Avenue, Philadelphia, Pennsylvania, for circular TD-901.

SPECIAL AND STANDARD SIZED WASHER DIES.—The Detroit Stamping Company has issued a bulletin listing several hundred sizes of washer dies carried in stock. They include gang washer dies, round dies and combination dies for making accurate flat and concentric washers. Both inside and outside diameters are given. The dies will produce washers of any material and any thickness. Also described in this circular are De-Sta-Co milling machine arbor spacers, available in all standard arbor sizes, .001″ to .125″ thickness, with special thicknesses up to 3″, cut from bar stock and ground to decimal. They are provided with or without keyways. A trial assortment, enough spacers for use on one machine, is available. Write Detroit Stamping Company, 3443 West Fort Street, Detroit, Michigan, for TD-902.

"THE BEST TOOL CHEST YOU CAN BUY" is the title of a circular listing 49 reasons why. It's just off the press and may be had by writing H. Gerstner & Sons, 56 Columbia Street, Dayton, Ohio, for TD-903.

PRECISION TOOLS, GAGES, DIAL INDICATORS, HACK SAWS, ETC.—A complete, well indexed catalog illustrating and describing the complete line of precision tools manufactured by The L. S. Starrett Company. Die makers' squares, micrometer depth gages, vernier calipers and height gages, toolmakers' buttons for jig and die work, micrometer calipers, dial and test indicators, toolmakers' steel clamps, planer and shaper gages, toolmakers' calipers and dividers and drill gages are only a few of the many tools of particular interest to tool and die builders. A section of this 300-page book is devoted to the Starrett micrometer calipers which are available with many important improvements, such as carboloy facings or norbide inserts on anvil and spindle to insure long life, decimal equivalents of 8ths, 16ths, 32nds, and 64ths on the frame or spindle, and a cut-away frame which can be inserted where ordinary frames will not go. Starrett hack saw blades are illustrated and are available in tungsten alloy steel, high speed steel and S-M Molybdenum and are made in all standard sizes for hand frames or power machines. A number of suggestions are included on the correct use of hack saw blades in order to greatly increase their efficiency. Numerous arithmetical tables and charts will prove useful to tool and die makers, machinists and production officials. For a copy of this catalog covering the field of precision tools, write The L. S. Starrett Company, Athol, Massachusetts, for TD-904.

SHOP AND MACHINE LIGHTING FIXTURES.—A new circular describing and graphically illustrating the new Fluorescent Curtistrip, a unique lamp that steps-up lighting intensities without increased wattage consumption and eliminates brilliance, glare and shadows. Curtistrip is recommended for use over machines and work benches. With the special fittings described, the Fluorescent single and continuous strip lamps are available for exposed or concealed fixtures, for direct or indirect lighting schemes, for industrial and commercial installations. Complete specifications and instructions for installation are included. Write Curtis Lighting, 1123 West Jackson Boulevard, Chicago, Illinois, for TD-905.

SEAMLESS STEEL TUBES.—An 8-page bulletin announcing the latest development in the seamless tubing industry. It is a method of rolling known as the Foren Process that produces a new type of seamless tube. Unusually long lengths can be rolled by this process. Among the advantages discussed is the remarkably smooth inside finish resulting from the Foren Process due to the unique nature of the elongating operation, wherein the tube is worked over the mandrel bar, while both the bar and the tube are propelled forward through the close coupled, continuous rolling mill. This feature is important since it often permits the use of a tube with a lighter wall and less weight of metal to obtain the desired strength. Again, it eliminates the chance that scale or other solid matter may be deposited and become lodged. Smooth surfaces retard such deposits, and this feature is particularly valuable when tubing is used for boiler tubes, locomotive flues, oil and chemical tubes. These tubes are available in carbon steel and special analyses, including Toncan, nickel, chrome, stainless and S.A.E. alloys. Copies may be had upon request to The Bissett Steel Company, 945 East 67th Street, Cleveland, Ohio, for TD-906.

Tool Steel Heat Treatment

(Continued from page 27)

and this is the only reason for its use. If a supply of running water is not available, then it is advisable to use brine. It is commonly thought that steel quenched in brine is harder than steel quenched in water, but this is only true when so many pieces have been quenched that the liquids have become appreciably heated. As a quenching fluid, brine should be regarded as an adjunct to and not a substitute for water; it is useful when a supply of running water is not available, or when a large number of small tools or components are treated by the method of dump hardening.

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HANDY RACKS
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Keep shop orderly
Capacity 10,000 lbs. They last forever.
Buy on 30 day approval.
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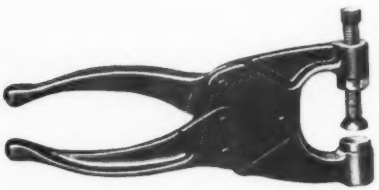
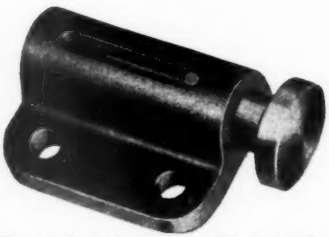
Tools, Dies, Jigs, Fixtures, Special Machinery
The Hamilton Portable Elevating Table

When you order or write about products described in TDM PROGRESS please mention the publication.

New Toggle Pliers Supercede "CEE" Clamps

THE toggle pliers shown herewith have recently been placed on the market to take the place of the widely used "CEE" clamp. Only six inches in length they develop great pressure from the compound leverage action used in the design. Unlike ordinary clamps, the screw adjustment is set prior to clamping, thus eliminating the tendency of the ferrule to wander over the work pieces being held. Their fast clamping action makes them particularly efficient for templet makers who work with sheet steel, as well as for toolmakers who have occasion to hold small parts to an angle when drilling, grinding, etc. Also available is a combining clamp and parallel, a new design which is more easily and effectively used than the "old-fashioned" toolmakers clamps that have to be used with a pair of parallels to support the work.





The spring stop gauge illustrated was developed to meet the rising demand for a standard component for use on dies, tools and fixtures. The cold rolled steel plunger purposely left soft has a chamfered head of ⅞ inch diameter. The pressure of the ¼-inch spring behind this plunger is sufficient to hold strip stock or semi-finished parts tightly against a positive locator. In this way, allowance may be made for variance in stock widths and spring-back of stampings, but with the assurance that the spring stop gauge will always take up the slack.

Both the toggle pliers and gauge are products of Knu-Vise Products Company, Inc., 4429 West Division Street, Chicago, Illinois, and descriptive circulars and prices may be had by mentioning this publication.

HAVE YOUR DIES WELDED
BY THE ATOMIC-HYDROGEN PROCESS
- Welding of Jigs and Fixtures
- Repairing and Refacing of Dies and Moulds
- Welding Broken Machine Parts
- Stellite or Alloy Facing of Wearing Parts
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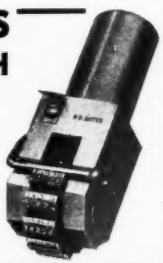

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● This directory of products lists for ready reference the names of manufacturers and dealers whose sales to Tool·Die·Machine PROGRESS readers have established them as dependable in every sense of the word. They merit your consideration.

● Complete information about any product may be had upon request made to the firm listed or to us.

● Your mention of Tool·Die·Machine PROGRESS will be appreciated.

ABRASIVE PAPER AND CLOTH
Carborundum Co., Niagara Falls, N. Y.

AIR CONDITIONING APPARATUS
Buffalo Forge Co., 477 Broadway, Buffalo, N. Y.

ASSEMBLING MACHINES—Automatic
Sommer & Adams Co., The, 18511 Euclid Ave., Cleveland, Ohio.

BARS—Rolled Composite
Forging and Casting Corp., Ferndale (Detroit), Michigan.

BEARINGS—Ball, Roller and Thrust
Ohio Ball Bearing Co., 6531 Euclid Avenue, Cleveland, Ohio.

BENDING MACHINES—Special
McKinney Tool & Mfg. Co., The, 1688 Arabella Rd., Cleveland, Ohio.

BENDING MACHINES—Angle Iron
Buffalo Forge Co., 477 Broadway, Buffalo, N. Y.

BOLTS—Stripper
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.

BORING HEAD
Precision Tool Co., Bridgeport, Conn.

BUSHINGS—Die
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.

BUSHINGS—Drill Jig
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Colonial Bushings, Inc., 147 Jos. Campau Ave., Detroit, Mich.

CASTINGS— Nitri-Cast-Iron, Air and Oil Hardening Tool Steel Cast to Shape
Forgings & Casting Corp., The, Ferndale (Detroit), Mich.

CASTINGS—Strenes Alloy
Advance Foundry Co., 100 Parnell Ave., Dayton, Ohio.

CHROME PLATING—Dies and Machine Parts, New and Worn
Master Chrome Service, Inc., 5611 Herman Ave., N.W., Cleveland, Ohio.

CLAMPS—Die
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.

CLAMPS—Toggle
Detroit Stamping Co., 3443 West Fort St., Detroit, Mich.
Knu-Vise Products Co., Inc., 6433 Cass Ave., Detroit, Michigan.

COMPARATOR
The Webber Gage Co., 2517 Vestry Ave., Cleveland, Ohio.

CONTOUR METAL-WORKING MACHINES
Continental Machine Specialties, 1301 S. Washington Ave., Minneapolis, Minn.

COUNTERBORES
Eclipse Counterbore Co., 7410 St. Aubin Ave., Detroit, Mich.
Putnam Tool Co., 2985 Charlevoix Ave., Detroit, Mich.

CRANKSHAFTS—Heat Treated for Presses
Enterprise Machine Parts Corp., 2731 Jerome Ave., Detroit, Mich.

CUT-OFF WHEELS
Carborundum Co., Niagara Falls, N. Y.

CUTTERS—Milling
Putnam Tool Co., 2985 Charlevoix, Detroit, Mich.
Weldon Tool Co., The, 3000 Woodhill Rd., Cleveland, Ohio.

CUTTERS—Die-sinking
Eclipse Counterbore Co., 7410 St. Aubin Ave., Detroit, Mich.

CUTTERS—Multi Diameter
Eclipse Counterbore Co., 7410 St. Aubin Ave., Detroit, Mich.

CUTTER GRINDERS—Universal and Standard
H. P. Preis Engraving Machine Co., 155-157 Summit St., Newark, N. J.

CUTTING MACHINES—Hand & Power
Buffalo Forge Co., 477 Broadway, Buffalo, N. Y.

DE-MAGNETIZER
Arlavox Mfg. Co., 428 So. Green St., Chicago, Ill.

DIAMOND STONES
Carborundum Co., Niagara Falls, N. Y.

DIAMOND WHEELS
Carborundum Co., Niagara Falls, N. Y.

DIE CASTING MACHINES
Phoenix Ice Machine Co., The, 2711 Church Ave., Cleveland, Ohio.

DIE MAKERS SUPPLIES
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.

DIE MAKING MACHINES
Continental Machine Specialties, Inc., 1301 Wash. Ave., Minneapolis, Minn.
Grob Brothers, Grafton, Wis.

DIE AND MOLD COPYING MACHINES—Three Dimensional
H. P. Preis Engraving Machine Co., 155-157 Summit St., Newark, N. J.

DIE SECTIONS—Composite Steel
Forging and Casting Corp., Ferndale (Detroit), Michigan.

DIE SECTIONS—Forged
Ajax Steel and Forge Co., 205 Adair St., Detroit, Mich.

DIE SETS
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.

DOWEL PINS
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.

DRESSING STICKS
Carborundum Co., Niagara Falls, N. Y.

DRILL—Portable Electric
Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Ill.

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Sommer & Adams Co., The, 18511 Euclid Ave., Cleveland, Ohio.

DRILL JIG—Toggle Action
Knu-Vise Products Co., Inc., 6433 Cass Ave., Detroit, Michigan.

DRILL JIG—Universal
Hartford Special Machinery Co., Hartford, Conn.

DRILL JIG BUSHINGS
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Colonial Bushings, Inc., 145 Jos Campau St., Detroit, Mich.

DRILL PRESSES—Single & Multiple Spindle
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ELEVATING TABLES—Portable
Hamilton Tool Co., The, 222 North B Street, Hamilton, Ohio.

END MILLS
Putnam Tool Co., 2985 Charlevoix, Detroit, Mich.
Weldon Tool Co., The, 3000 Woodhill Rd., Cleveland, Ohio.

ENGRAVING MACHINE — Pantographic
H. P. Preis Engraving Machine Co., 155-157 Summit St., Newark, N. J

FILES—Hand
Grobet File Corp. of America, 3 Park Place, New York, N. Y.

FILES—Rotary
Grobet File Corp. of America, 3 Park Place, New York, N. Y.
Hamilton Tool Co., The, 222 North B Street, Hamilton, Ohio.

FILING MACHINES—Continuous
Continental Machine Specialties, Inc., 1301 Washington Ave., S., Minneapolis, Minn.
Grob Brothers, Grafton, Wis.

FORGINGS—General
Ajax Steel & Forge Co., 205 Adair St., Detroit, Mich.

FORGINGS—Water and Oil Hardening, High Speed, Special Alloy, Stainless and S.A.E. Steel
Forging and Casting Corp., Ferndale (Detroit), Michigan.

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GAGES—Spring Stop
Knu-Vise Products Co., Inc., 6433 Cass Ave., Detroit, Michigan.

GAGES—Standard
Lincoln Park Tool & Gage Co., 1721 Ferris Ave., Lincoln Park, Mich.

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Safety Grinding Wheel & Mach. Co., The, Springfield, Ohio.

GRINDING WHEELS
Carborundum Company, The, Niagara Falls, New York.
Safety Grinding Wheel & Machine Co., The, Springfield, Ohio.

GRINDING WHEEL DRESSERS
Vinco Tool Co., 7352 Central Ave., Detroit, Mich.

GUIDE PINS
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.

HACK SAW SHARPENING
Machinists Tool Grinding Co., 2836 W. Lake St., Chicago, Ill.

HONING STICKS
Carborundum Co., Niagara Falls, N. Y.

JIG BORING—Contract
Kiffer Tool & Die Co., 5601 Tillman Ave., Cleveland, Ohio.
Precision Boring Co., 2900 E. Vernor Highway, Detroit, Michigan.
Swiss Boring Co., 3916 Vermont Ave., Detroit, Mich.

LAPS—Copper Head Expansion
Boyar-Schultz, Inc., 2114 Walnut Street, Chicago, Ill.

LAPPING COMPOUND
Carborundum Co., Niagara Falls, N. Y.

LAPPING MACHINES
Schraner & Co., A. P., 3338 Payne Ave., Cleveland, Ohio.

LAYOUT FLUID — For Dies, Templates
The Dykem Co., 2201 No. 11th St., St. Louis, Mo.

LEADER PINS
Acme Industrial Co., 206 No. Laflin St., Chicago, Ill.

LIGHT—Adjustable For Shop Use
J. Zagora Machine & Parts Co., 1231 Mint Street, Charlotte, No. Carolina.

MACHINE REBUILDING
Enterprise Machine Parts Corp., 2731 Jerome Avenue, Detroit, Mich.

MACHINERY DEALERS
Brett Machinery Co., One N. Crawford Ave., Chicago, Ill.

MAGNETIC SINE TABLE
Omer E. Robbins Co., 637 Mt. Elliott Ave., Detroit, Mich.

MILLING MACHINES—Continuous
Sommer & Adams Co., The, 18511 Euclid Ave., Cleveland, Ohio.

MILLING MACHINE—Universal
H. P. Preis Engraving Machine Co., 155-157 Summit St., Newark, N. J.

NUMBERING DEVICES
H. O. Bates, 68 Barclay St., New York, N. Y.

PARALLELS
Ford Motor Co., Johansson Div., Dearborn, Mich.

PANTOGRAPH MACHINES
H. P. Preis Engraving Machine Co., 155-157 Summit St., Newark, N. J.

POLISHING MACHINE—Portable Electric
Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Ill.

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Sommer & Adams Co., The, 18511 Euclid Ave., Cleveland Ohio.

POLISHING GRAIN—
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Knu-Vise Products Co., Inc., 6433 Cass Ave., Detroit, Michigan.

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Porter Steel Treating Co., The Geo. H., 1225 Marquette St., Cleveland, Ohio.

SAW & SHEAR CUT-OFF MACH.—Automatic
McKinney Tool & Mfg. Co., The, 1688 Arabella Rd., Cleveland, Ohio.

SAWING MACHINES—Continuous
Continental Machine Specialties, Inc., 1301 So. Washington St., Minneapolis, Minn.

SAWING MACHINES—Open End
Grob Brothers, Grafton, Wis.

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Ulmer Co., The J. C., 1791 East 38th St., Cleveland, Ohio.

SCREW MACHINE PRODUCTS—Hardened & Ground
Acme Industrial Co., 206 No. Laflin St., Chicago, Illinois.

SCREWS—Socket Head
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Holo-Krome Screw Corp., The, Hartford, Conn.
Strong, Carlisle & Hammond Co., 1302 West Third St., Cleveland, Ohio.

SCREWS—Transfer
Nielson Tool & Die Company, 1859 Gardner Ave., Berkley, Michigan.

SCRIBERS
Ford Motor Co., Johansson Div., Dearborn, Mich.

SHARPENING STONES
Carborundum Co., Niagara Falls, N. Y.

SHEARS—Bolt & Rivet—Automatic
Buffalo Forge Co., 477 Broadway, Buffalo, N. Y.

SINE BARS
Ford Motor Co., Johansson Div., Dearborn, Mich.

SPACERS—For Milling Machine Arbors
Detroit Stamping Co., 3443 West Fort St., Detroit, Mich.

SPACING FIXTURES
Hartford Special Machinery Co., Hartford, Conn.

SPRING MAKING MACHINERY
Sleeper & Hartley, Inc., Worcester, Massachusetts.

SPRINGS—Die
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.

STAMPINGS
Barth Stamping & Mach. Works, W. 94th & Denison, Cleveland, Ohio.
Boehm Pressed Steel Co., The, 2225 West 63rd St., Cleveland, Ohio.
Davis Tool & Engineering Co., 6481 Epworth Blvd., Detroit, Mich.
Denning Mfg. Co., The, 1775-81 E. 87th St., Cleveland, Ohio.
Detroit Stamping Co., 3443 West Fort St., Detroit, Mich.
Modern Tool & Die Co., P. O. Box 2741, Cleveland, Ohio.
Rockford Die & Tool Wks., Inc., 1816 Seventeenth St., Rockford, Ill.
Star Machine & Tool Co., 9320 Woodland Ave., Cleveland, Ohio.
Star Tool & Die Works, 2522 24th St., Detroit, Mich.
Ulmer Co., The J. C., 1791 East 38th
Variety Machine & Stamping Co., The, 12695 Elmwood Ave., Cleveland, Ohio. St., Cleveland, Ohio.

STEEL—Alloy
Columbia Tool Steel Co., 410 East 14th St., Chicago Heights, Ill.
Darwin & Milner, Inc., 1258-64 West Fourth Street, Cleveland, Ohio.
Wheelock-Lovejoy & Co., Inc., 130 Sidney St., Cambridge, Mass.

STEEL—Carbon
Columbia Tool Steel Co., 410 East 14th St., Chicago Heights, Ill.
Darwin & Milner, Inc., 1258-64 West Fourth Street, Cleveland, Ohio.

STEEL—Chromium
Darwin & Milner, Inc., 1258-64 West Fourth St., Cleveland Ohio.

STEEL—"Cobalt"
Darwin & Milner, Inc., 1258-64 West 4th St., Cleveland, Ohio.

STEEL—High Speed
Ajax Steel & Forge Co., 205 Adair St., Detroit, Mich.
Columbia Tool Steel Co., 410 East 14th Street, Chicago Heights, Ill.
Darwin & Milner, Inc., 1258-64 West 4th St., Cleveland, Ohio.

STEEL—Stainless
Ajax Steel & Forge Co., 205 Adair St., Detroit, Mich.

STEEL—Tool & Die
Columbia Tool Steel Co., 410 E. 14th St., Chicago Heights, Ill.
Darwin & Milner, Inc., 1258-64 West 4th St., Cleveland, Ohio.
Wheelock-Lovejoy & Co., Inc., 130 Sidney St., Cambridge, Mass.

STEEL PLATE—Rough or Machined Toreh Cut Shapes
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.

STEEL TREATING—Hardening
Porter Steel Treating Co., The Geo. H., 1225 Marquette St., Cleveland, Ohio.

STRAIGHT EDGES
Ford Motor Co., Johansson Div., Dearborn, Mass.

STRAIGHTENING MACHINES
Buffalo Forge Co., 477 Broadway, Buffalo, N. Y.

TAPPING MACHINES
Buffalo Forge Co., 477 Broadway, Buffalo, N. Y.

TOOLS AND DIES—Carboloy
Kiffer Tool & Die Co., 5601 Tillman Ave., Cleveland, Ohio.

TOOLS—Cemented Carbide Tipped
Eclipse Counterbore Co., 7410 St. Aubin Ave., Detroit, Mich.

TOOL CHESTS
Gerstner Tool Chests, 56 Columbia St., Dayton, Ohio.

TOOL HEAD—Universal
Precision Tool Co., The, Bridgeport, Conn.

TOOL HOLDERS
Weldon Tool Co., The, 3000 Woodhill Rd., Cleveland, Ohio.

TRANSFER SCREWS
Nielson Tool & Die Co., 1859 Gardner Avenue, Berkley, Michigan.

TRANSMISSION UNITS
Ohio Ball Bearing Co., 6531 Euclid Avenue, Cleveland Ohio.

TUBING—Tool Steel
Bissett Steel Co., The, 947 E. 67th St., Cleveland, Ohio.

TYPE HOLDER
H. O. Bates, 68 Barclay St., New York, N. Y.

VENTILATING APPARATUS
Buffalo Forge Co., 477 Broadway, Buffalo, N. Y.

WASHERS—Special
Detroit Stamping Co., 3443 West Fort St., Detroit, Mich.

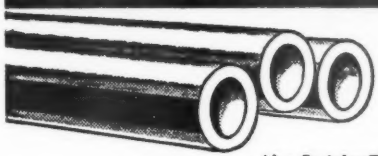
WELDING
Danly Machine Specialties, Inc., 2121 So. 52nd Ave., Chicago, Ill.
Overly-Hautz Co., 1621 West 116th St., Cleveland, Ohio.
Star Tool & Die Works, 2522 24th St., Detroit, Mich.

WELDING PLIERS
Knu-Vise Products Co., Inc., 6433 Cass Ave., Detroit, Michigan.

WIRE MILL EQUIPMENT
Sleeper & Hartley, Inc., Worcester, Massachusetts.

WIRE-WORKING MACHINERY
Sleeper & Hartley, Inc., Worcester, Massachusetts.

OIL HARDENING TOOL STEEL TUBING

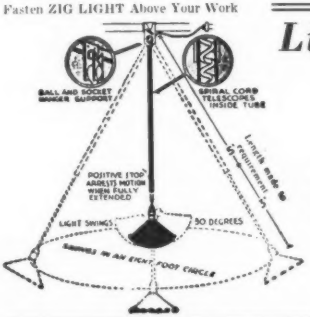


Substantially reduces labor costs by eliminating the expensive procedure of drilling from the solid.

BISCO TOOL STEEL TUBING is a fine grade tool steel in tubular form available in sizes up to 14" diameter and 2" wall thickness; other sizes to your specification.

THE BISSETT STEEL COMPANY
947 E. 67th St., Cleveland, Ohio
1036 W. Lake St., Chicago, Ill. 367 Main St., Buffalo, N.Y.
Also StainlessTubes, Mechanical Tubes, Aircraft Tubes, Pressure Tubes

Fasten ZIG LIGHT Above Your Work


BALL AND SOCKET SHADE SUPPORT
SPIRAL CORD TELESCOPES INSIDE TUBE
POSITIVE STOP ARM(S) MOTION WHEN FULLY EXTENDED
LIGHT SWINGS
90 DEGREES
SWINGS IN AN EIGHT FOOT CIRCLE

Light **WHERE YOU NEED IT!**

From the top, from the side; close to the work or with wide coverage. Always without glare.

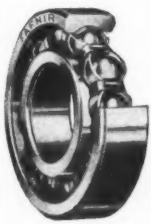
ZIG-LIGHT SUPPORT

A Universal Movable Light Fixture which "stays put" wherever you need it. It may be supported overhead or from an arch fastened to the machine. Modern localized light with a radius of action up to ten feet. Moderate prices depending upon size and style.

Write for literature

J. ZAGORA MACHINE & GEAR CO.
1329 S. Mint Street Charlotte, N. C.

"Bearing Specialists"



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Immediate Service from 6 Complete Stocks

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AKRON CLEVELAND TOLEDO
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When you order or write about products described in TDM PROGRESS please mention the publication.

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Among these shops will be found modern facilities for building every kind of Special Tool, Die and Machine. Some are equipped for small and medium size work, others for large. Some do Designing and Engineering, Development and Experimental Work and build Models; others are equipped for production of Precision Specialties of every description. Still others operate Machine Production plants and manufacture Parts, Stampings and Complete Assemblies. All will appreciate the opportunity to submit estimates.

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GLENN A. BARTH THOM. A. BARTH
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Blanking, Forming, Drawing, Piercing
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Designers and Builders
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COMPLETE PLANT
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*See larger display advertisement also.

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HIGH GRADE DIES

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Modern equipped shop for building of
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DIES, TOOLS, SPECIAL MACHINERY
Equipment includes:
3" and 5" spindle Horizontal Boring Mills
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THE McKINNEY TOOL & MFG. CO.
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DESIGNERS AND BUILDERS
Tools and Dies *Special Machinery*
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OHIO TOOL COMPANY
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Designers and Builders
SHEET METAL DIES, TOOLS, SPECIAL MACHINERY, DIE CASTING DIES, RUBBER MOULDS
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Modern Facilities
150-Man Shop

THE PARAMOUNT TOOL CO.
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JIGS, FIXTURES, DIES
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The PHOENIX ICE MACHINE COMPANY
2711 Church Ave. CHerry 1048
PLANERS
42" by 14 ft. long
24" by 6 ft. long
Let us figure

A. P. SCHRANER & COMPANY
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EXTERNAL CYLINDRICAL
LAPPING MACHINES
Special Machinery
TOOLS, DIES, JIGS, FIXTURES

***THE SOMMER & ADAMS CO.**
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DESIGNERS AND BUILDERS
Special Machinery
TOOLS, JIGS and FIXTURES

STAR MACHINE & TOOL CO.
Established 1903
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DIES - JIGS - FIXTURES
Special Machines
JIG BORING with
Pratt & Whitney Precision Equipment
NEW OPENSIDE PLANER EQUIPMENT
12 ft. x 48" Capacity

TOOLS & GAGES, Inc.
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"Let us be your tool room."
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Special Machinery *Designing and Building*
Experimental, Model, Punch Press and
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THE VARIETY MACHINE & STAMPING COMPANY
12695 Elmwood Ave. LAkewood 8433
Designers and Manufacturers
Dies, Metal Stampings 250 tons capacity

Dayton, Ohio

THE INTERNATIONAL TOOL CO.
434-438 East First St.
Manufacturers and Engineers
Dies, Jigs, Fixtures, Gages
Special Machinery, Machine Work, Designing

When you order or write about products described in TDM PROGRESS please mention the publication.

1939 Business Will Be Better

(Continued from page 10)

faith in the future, and sufficient confidence in the prospects for profits, to lead them to shape their plans by long-term expectations. It cannot happen while we guide our national policies by the theory that recovery depends on consumer purchasing power supplied by pump-priming expenditures.

"This second recovery attempt of ours is based on the same economic doctrines that we followed last time. We have profited somewhat by experience, and the federal spending is being better administered than it was before. Nevertheless we are still failing to deal with the controlling factors. These include the problems of the railroads and the utilities, the meagerness of business profits, the difficulties of labor relations, and the competition of government with business.

"We are justified in feeling pretty confident about business improvement next year, and especially in the first half of next year, but this country needs a longer-term confidence than that. The year 1939 will test our national capacity to generate a self-supporting recovery. If we can do that, and if the international situation does not become too unfavorable, our recovery can last a long time. The outcome depends on government and business, and on their ability to overcome obstacles in order to seize opportunities."

Die Buyer and Seller

(Continued from page 12)

actually let. This sometimes leads to misunderstandings and then there have to be compromises on both sides.

The numerous factors which enter into estimating the cost of building a die should be understood by the buyer. Among them are a shop's equipment, facilities, operating efficiencies and overhead. A buyer should realize also that the steels and other materials to be used and the requirements as to delivery enter very definitely into the cost of building dies. Regardless of which method may be employed for setting forth the requirements of the die buyer, more satisfactory dealings will always result when representatives of buyer and seller speak the same language and understand the requirements of both die making and stamping manufacture.

Cleveland Small Shop Site For Sale

Unusually suitable lot for Tool and Die shop, precision manufacturing plant or stock depot and office. Has abundance of permanent light on three sides. Located midway between East and West industrial districts. Convenient to supply houses. Size 59 feet x 125 feet and priced right. Write Box 20, TDM PROGRESS, 215 Fairmount-Cedar Bldg., Cleveland, Ohio.

Pioneer Shop Owner

(Continued from page 18)

building done in what has come to be known as the Contract Tool Shop. When I think of what is accomplished by machines which we have built in recent years and compare them with those of only twenty years ago, it astounds me. The operating precision of the present machine, the never-failing accuracy of its product—despite its frequent intricacy of operation—is a tribute to the skill of the tool maker and machine builder."

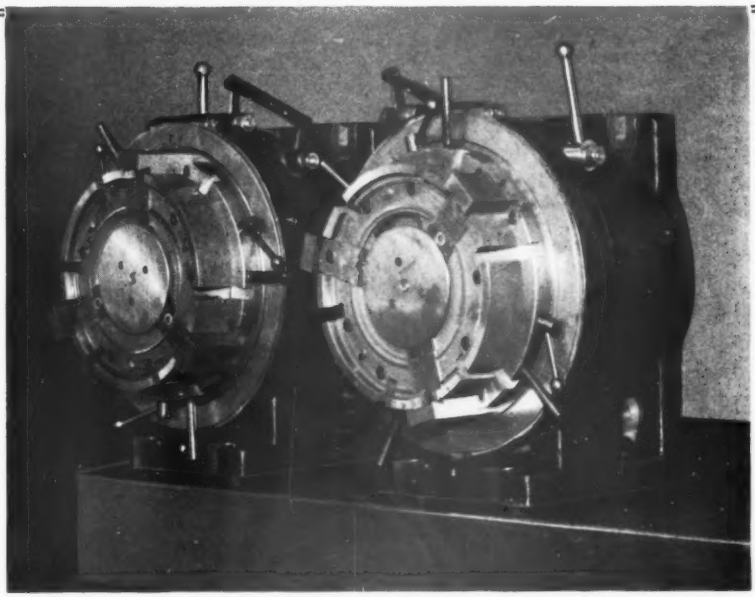
What about wages and hours during your quarter century of experience in the Industry, we asked Mr. Lyons.

"I have seen the hourly rate of pay for a skilled man come up from 27½¢ to $1.25 and working hours decline from ten and twelve for a day's work to eight. Sixty hours per week was regular and no over-time premium either. But I have come to see that the present is a far more equitable arrangement for the employer as well as the employee. There were abuses in the old system and lots of unfair competition."

"There's one thing I'd like to have you know about this retiring. I expect to continue to work hard. I've got a 200-acre farm. That, and a family of a dozen children—my own and those they have brought into the family—will keep me both busy and happy."

As a pioneer tool shop owner, Joseph Lyons is widely and favorably regarded throughout Ohio and in the Industry. He is President of the Northern Ohio Division of the Special Tool, Die and Machine Shop Institute, to which office he has been elected three times. He is also a member of the Board of Trustees of the national organization.

JIGS . . . FIXTURES . . . TOOLS . . . GAGES
accurately designed . . . economically built



2 air operated index checking fixtures for milling lugs on automobile clutch plates.

We have had many years of experience designing and building efficient *Special Tooling* and *Machines* for production manufacturers .... We have the facilities for building them economically and promptly .... We would like to prove our case by submitting estimates on your requirements .... Please send us your prints.

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We are builders of the highly efficient S & A Automatic Machines for Continuous Milling, Drilling and Polishing.

Please send for particulars

THE SOMMER & ADAMS COMPANY

18511 Euclid Avenue — Cleveland, Ohio

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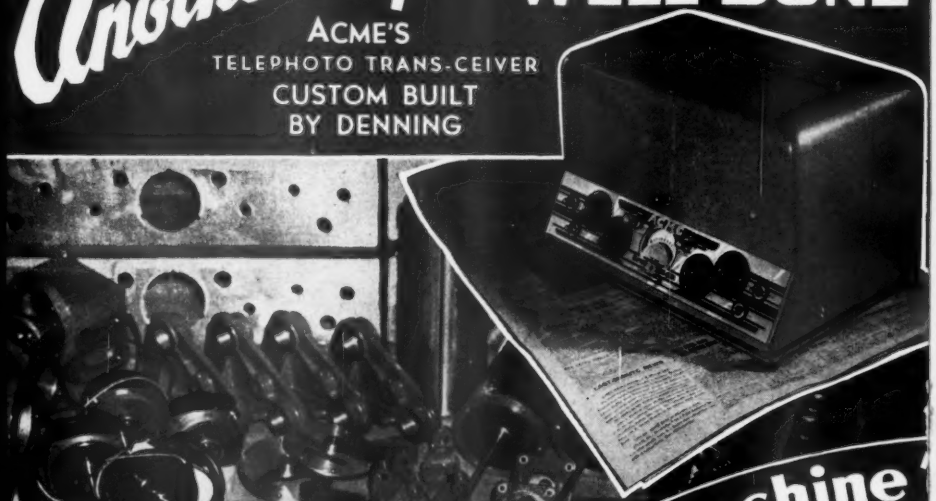
Another Important Job WELL DONE

ACME'S
TELEPHOTO TRANS-CEIVER
CUSTOM BUILT
BY DENNING



"Miracles in Tiny Machine"

If you haven't read this interesting story featured in the Cleveland Press, advise us. We have a few copies and will send you one.

The story tells how the newspapers, in seven minutes, obtain their pictures from remote places by Acme's Telephoto Transceiver.

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The Dies, Jigs, and Fixtures for this job were made by Denning. Also, the accurate machining of special parts, the careful supervision of assembly and final tests have made it possible to build into these sensitive little instruments the smooth performance so essential to the successful transmission of news pictures over telephone wires.

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